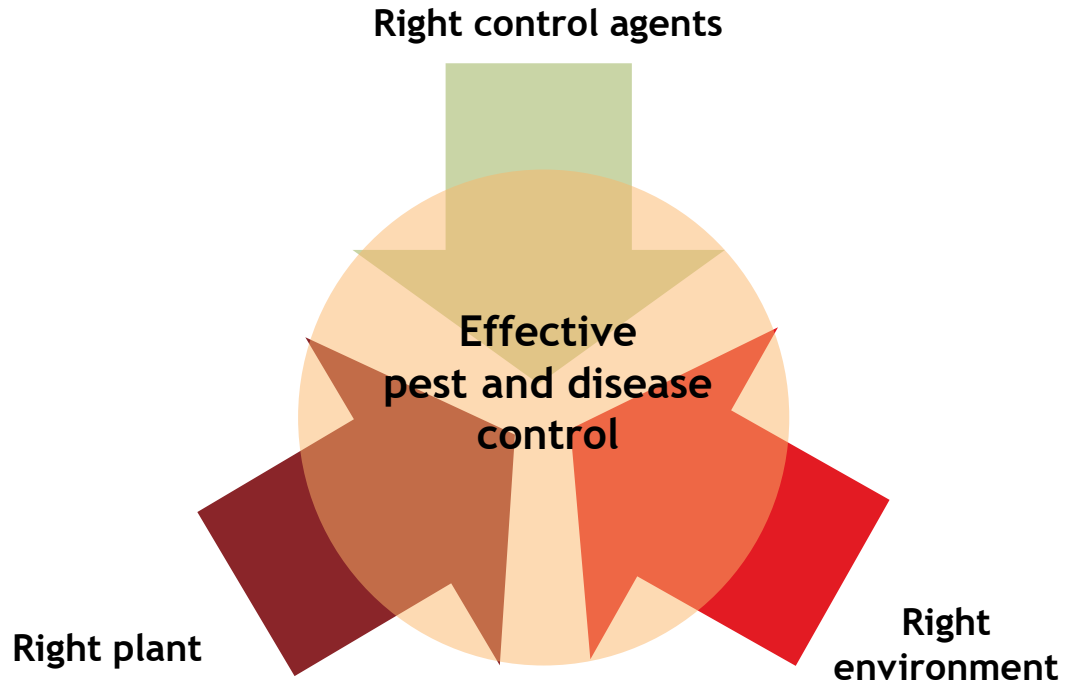# Utilizing the power of beneficial microbes in a systems approach to plant disease management

Liza DeGenring
Graduate Research Assistant
Poleatewich Plant Pathology Lab

Department of Agriculture, Nutrition and Food Systems
UNH

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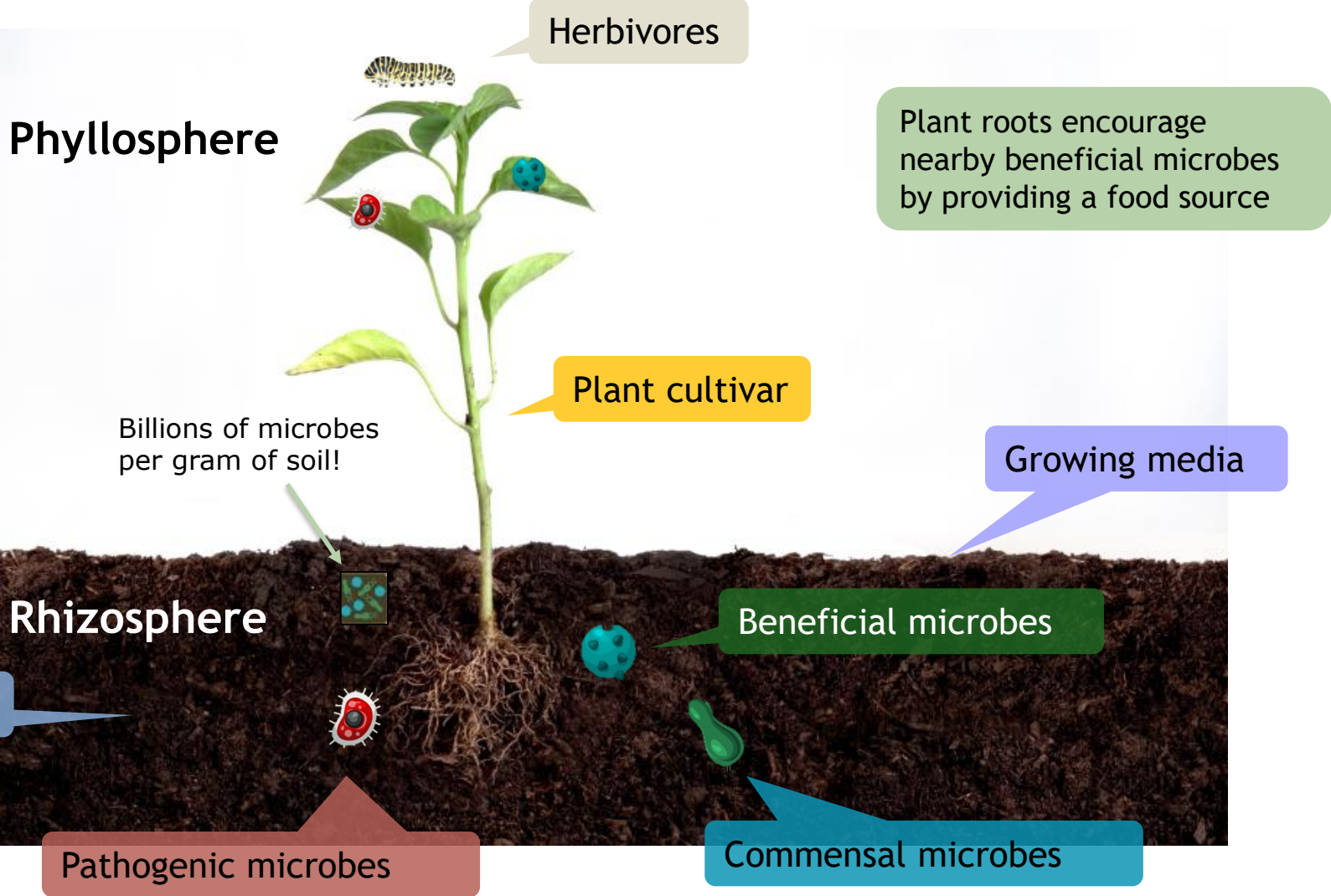
Many factors influence plant health

Diagram adapted from Monsanto BioAg

| Pathogen Type | Plant Cultivar | Plant age | Growing substrate | Biocontrol or inducing agent |

| Activation of plant defenses | ← → | Microbial population dynamics | ← → | Root exudates and 2º metabolites |

Degree of disease suppression under commercial conditions

Evaluating the effect of cultivar on biocontrol efficacy in a tomato system

Cultivar

Cultivars: Glamour, Ailsa Craig, Trust, & Maxifort F1
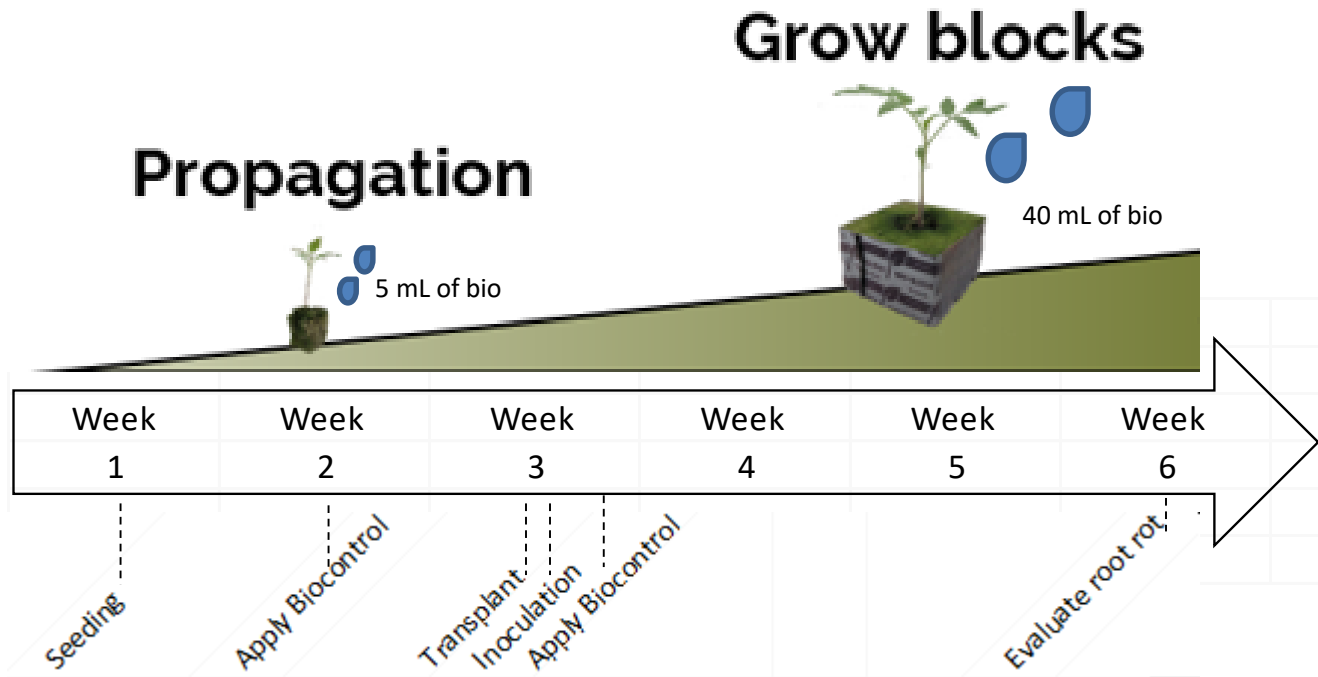
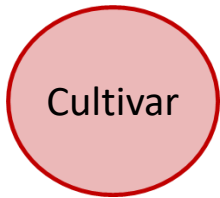Pathogen: *Pythium aphanidermatum* isolate KOP8

Biological Control Products:

Cease, Rootshield, & Water Control

L. DeGenring

Used rockwool – a material that is made up of melted rock and sand that is spun into a fiber

Evaluating the effect of cultivar on biocontrol efficacy in a tomato system

Cultivar

Biofungicide products used, the active ingredients, and the rate applied

Product	Active Ingredient	Rate
Rootshield® WP	*Trichoderma harzianum* T-22	0.4 g/L
Cease®	*Bacillus subtilis* QST-713	15 ml/L

Evaluating the effect of cultivar on biocontrol efficacy in a tomato system

Cultivar

Mean root rot severity
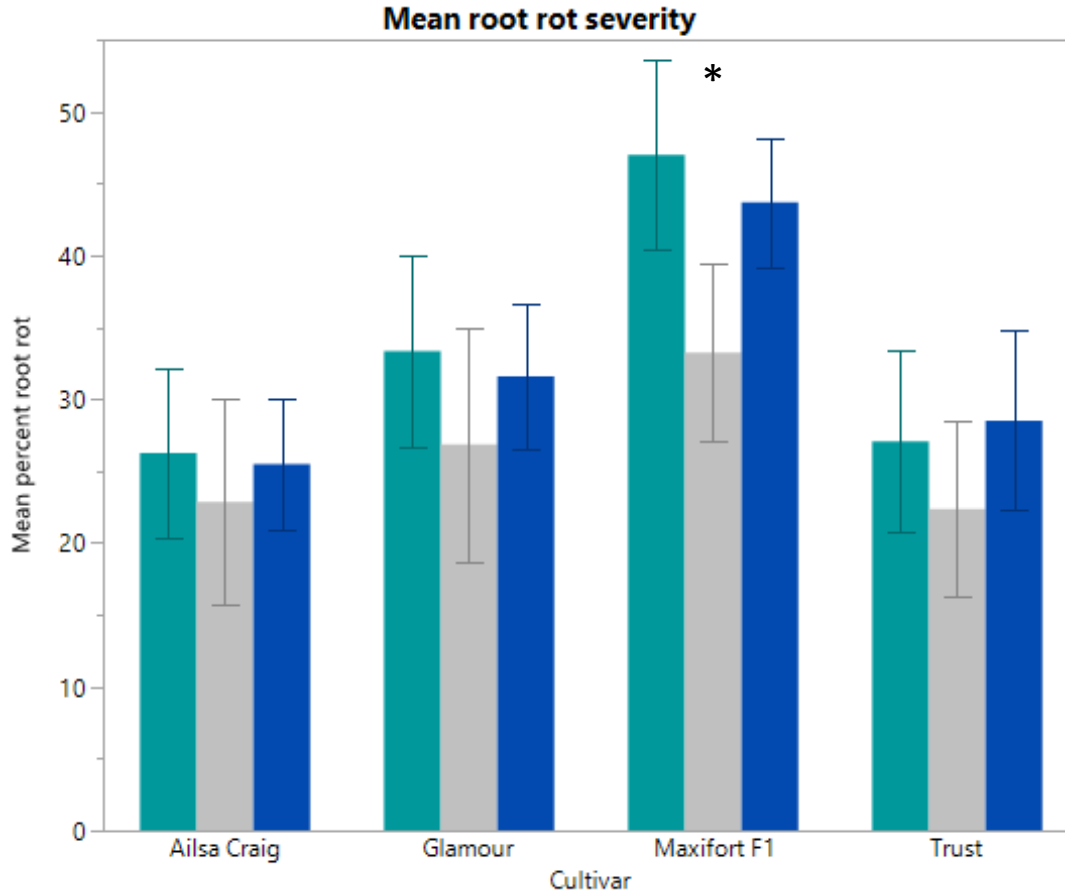
Biocontrol
- Cease
- Rootshield
- Control

Mean root rot severity on tomato plants 21 days post infestation with *P. aphanidermatum* isolate KOP8. Error bars represent the standard error of the mean.

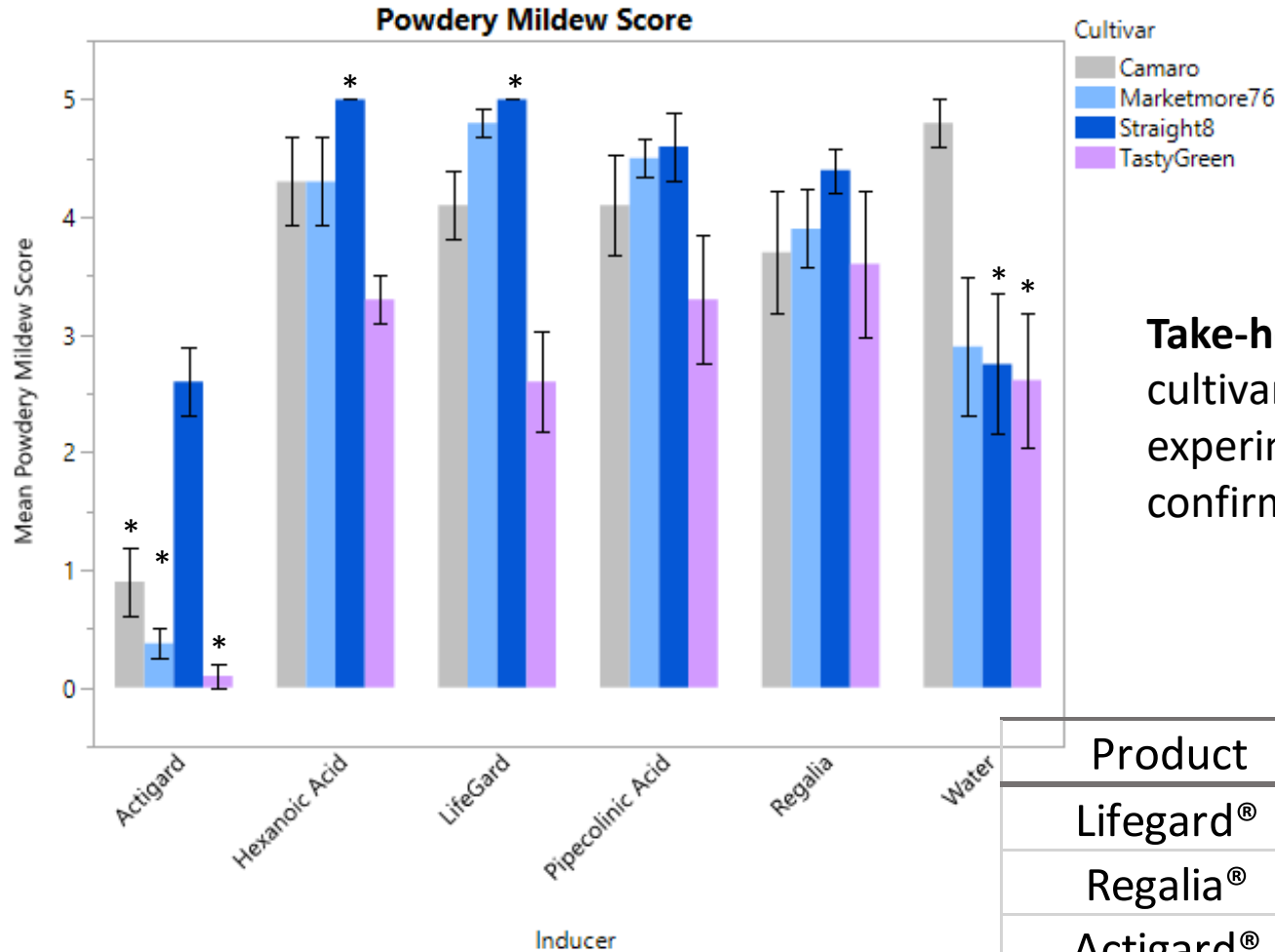| main effects			
Experiment (Df=1)	Cultivar (Df=3)	Biocontrol (Df=2)	Pythium (Df=1)
<0.0001	0.004	0.1009	<0.0001

Experiment 1 = Summer 2018

Experiment 2 = Fall 2018

In Experiment 2, there was a significant difference (*p* -value = 0.0002) with Rootshield having lower disease

Evaluating biochemical inducers to suppress powdery mildew in different cucumber cultivars

Cultivar

Cultivars: Tasty Green, Marketmore 76, Straight 8, Camaro

Pathogen: Powdery Mildew

Biochemical Inducers: Regalia, Actigard, LifeGard, Hexanoic Acid, Pipecolinic Acid, & Water Control

L. DeGenring

Days post seeding	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Plant seeds in rockwool plugs	■																				
Transplant to rockwool blocks										■											
Apply Inducers													■								
Challenge with PM														■							
Score disease																			■	■	

Evaluating biochemical inducers to suppress powdery mildew in different cucumber cultivars

Cultivar

Take-home: there is an effect of cultivar but this was only one experiment, more are needed to confirm this trend

Product	Rate	Application
Lifegard®	0.374 g/L	Foliar
Regalia®	5 mL	Drench
Actigard®	0.063 g/L	Drench
Hexonic Acid	0.12 g/L	Drench
Pipecolinic Acid	0.13 g/L	Foliar

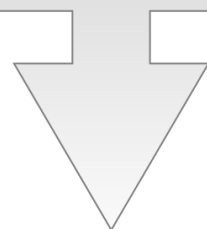| Pathogen Type	Plant Cultivar	Plant age	Growing substrate	Biocontrol or inducing agent
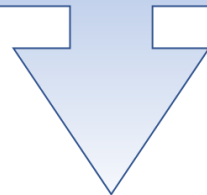
Activation of plant defenses ⟷ Microbial population dynamics ⟷ Root exudates and 2º metabolites

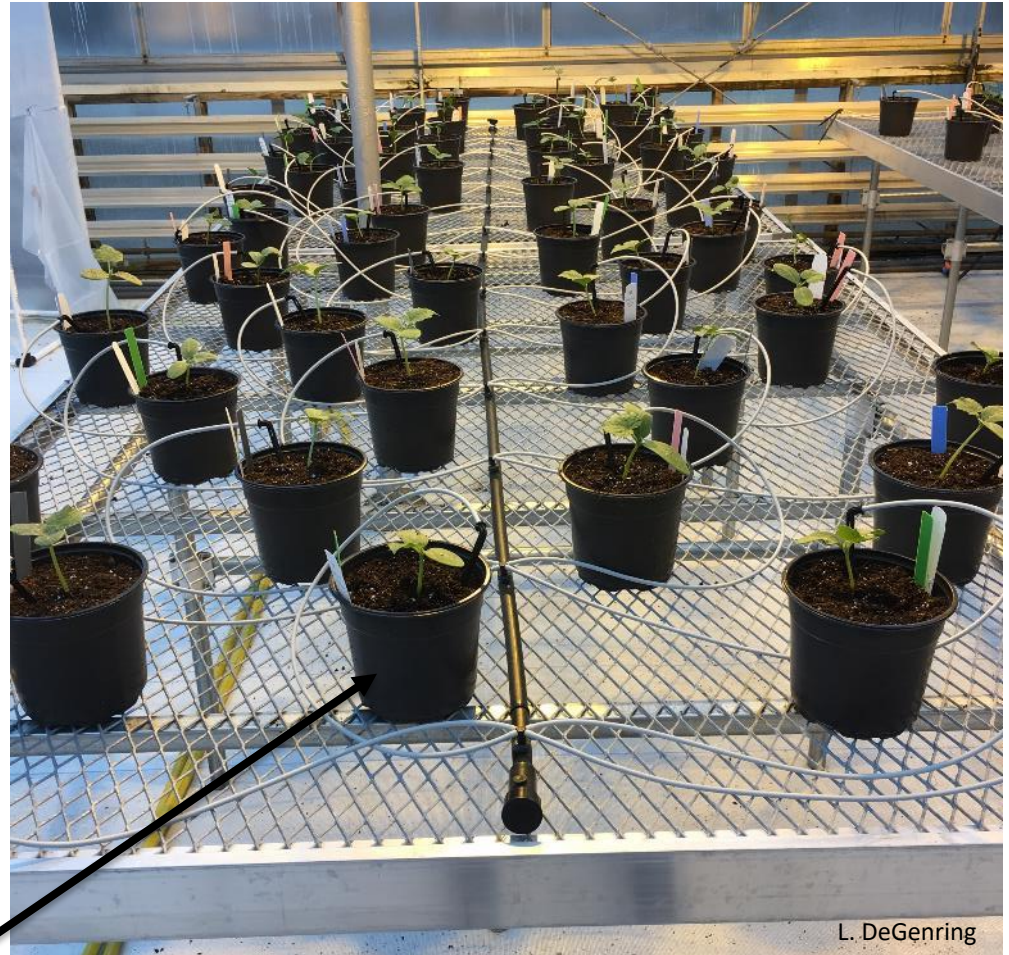Degree of disease suppression under commercial conditions

Evaluating the effect of propagation substrate on biocontrol efficacy in a cucumber system

Substrate

Substrate: Jiffy 7 Peat, Jiffy 7 Coco Coir, & Oasis

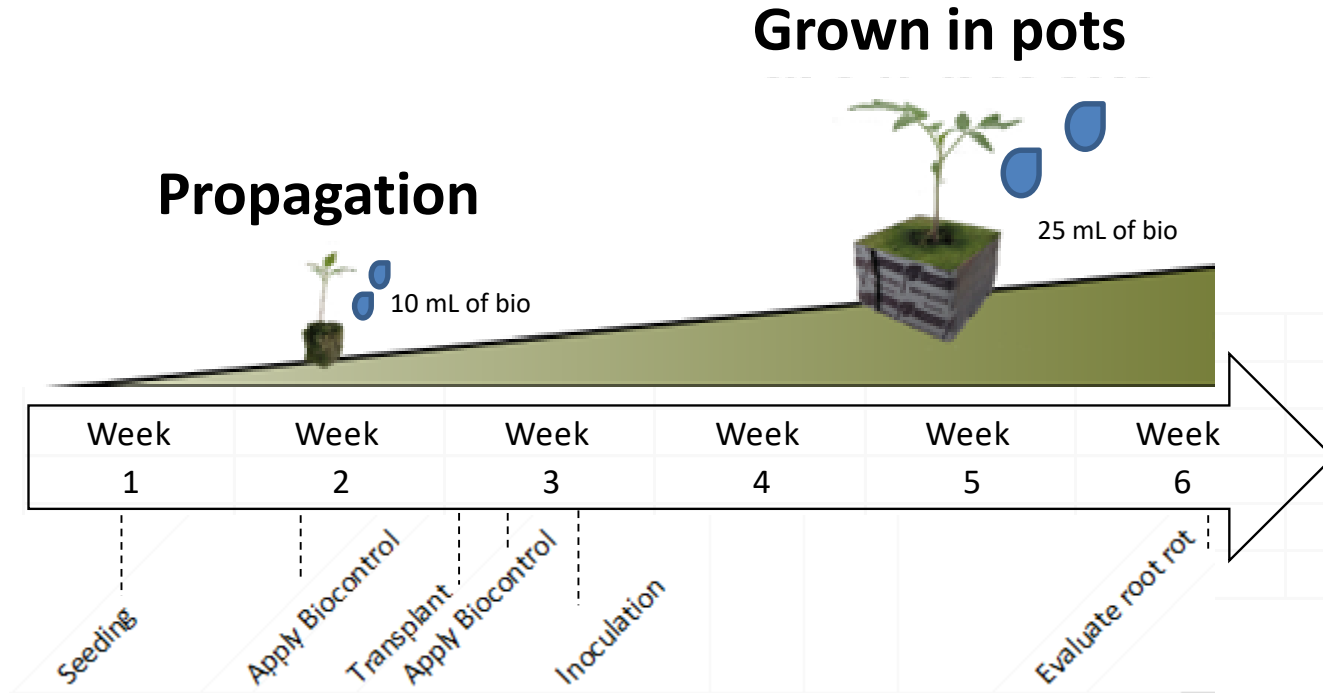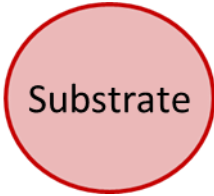**Pathogen:** *Pythium aphanidermatum* isolate KOP8

Biological Control Products:

Cease, Rootshield, Regalia, & Water Control

L. DeGenring

Transplanted into a 1:1 peat:coco coir mix. Used cucumber cultivar Straight 8

Evaluating the effect of cultivar on biocontrol efficacy in a cucumber system

Grown in pots

Propagation

25 mL of bio

10 mL of bio

Week 1	Week 2	Week 3	Week 4	Week 5	Week 6

Seeding

Apply Biocontrol

Transplant
Apply Biocontrol

Inoculation

Evaluate root rot

Product	Active Ingredient	Rate
Rootshield® WP	*Trichoderma harzianum* T-22	0.4 g/L
Regalia®	Extract of *Reynoutria sachalinensis*	5 mL/L
Cease®	*Bacillus subtilis QST-713*	15 ml/L

Evaluating the effect of cultivar on biocontrol efficacy in a cucumber system
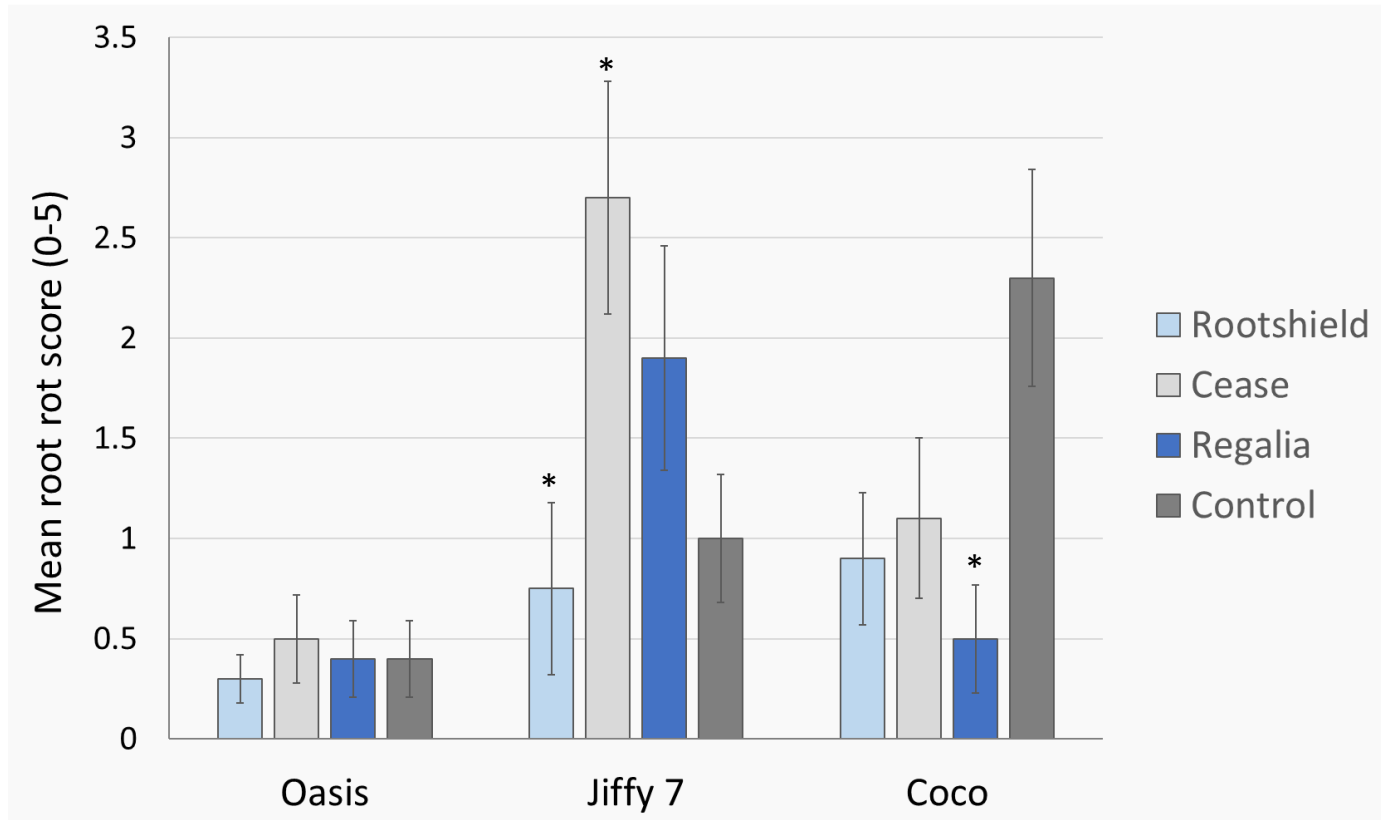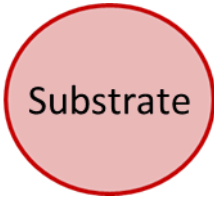
Substrate

Mean root rot severity on cucumber plants 16 days post infestation with *P. aphanidermatum* isolate KOP8. Error bars represent the standard error of the mean (n=5).

	main effects		Interactions
	Product (Df=3)	Substrate (Df=2)	Product x substrate (Df=6)
Root rot	0.0753	0.0002	0.0042

Take-home: there is an effect of substrate but this was only one experiment, more are needed to confirm this trend

Summary:

Cultivar and substrate seem to have an effect on the efficacy of biocontrol products

Further research necessary to understand why

Future Research:

- Replicate experiments
- Substrate studies
  - Wood fiber

Have any research questions about biocontrols?
e-mail: Liza.Degenring@unh.edu

Thank you!

Thank you to our supporters:

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